

APPENDIX C

TECHNICAL SPECIFICATIONS

C.1 GENERAL

C.1.1 Scope. This appendix provides additional technical specifications concerning the display of warfighting symbology. These specifications are intended to present guidance to assist in defining effective implementations of both icon-based symbols and tactical graphics. This appendix is a mandatory part of this standard. The information contained herein is intended for compliance.

C.2 APPLICABLE DOCUMENTS

This section is not applicable to this appendix.

C.3 DEFINITIONS

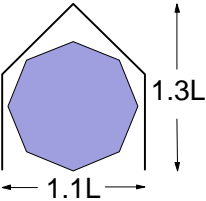
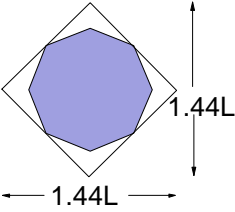
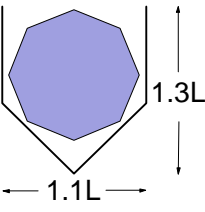
The definitions in section 3 of this standard apply to this appendix.

C.4 TECHNICAL SPECIFICATIONS

C.4.1 Relative symbol and modifier dimensions. The relative size of each symbol and symbol component shall be consistent within a given implementation. Each of these sizes can be related to length L (see C.4.2) as follows:

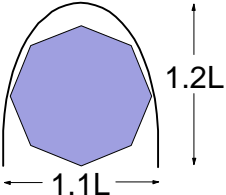
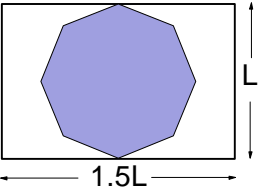
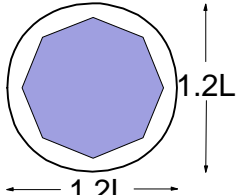
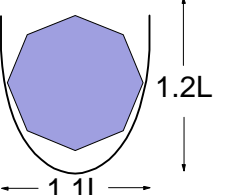
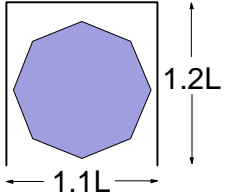
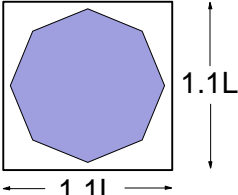
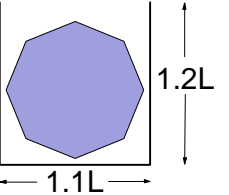
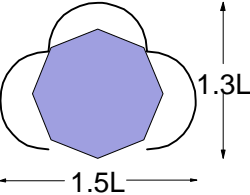
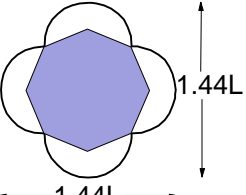
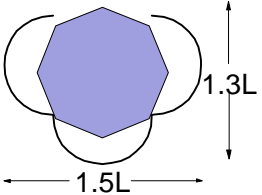
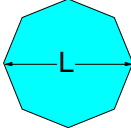
a. Frame size shall be determined in relation to an octagon defining the outer boundary for all icons. L is the default length and height of the octagon. Frame length and height should vary from $1.1L$ to $1.5L$, depending on the particular shape, as shown in figure C-1. The minimum diameter of a dot should be $.15L$.

FIGURE C-1. Symbol frame relative sizes.

Air and Space	Surface Frames (units, equipment and installations)	Subsurface frames
		

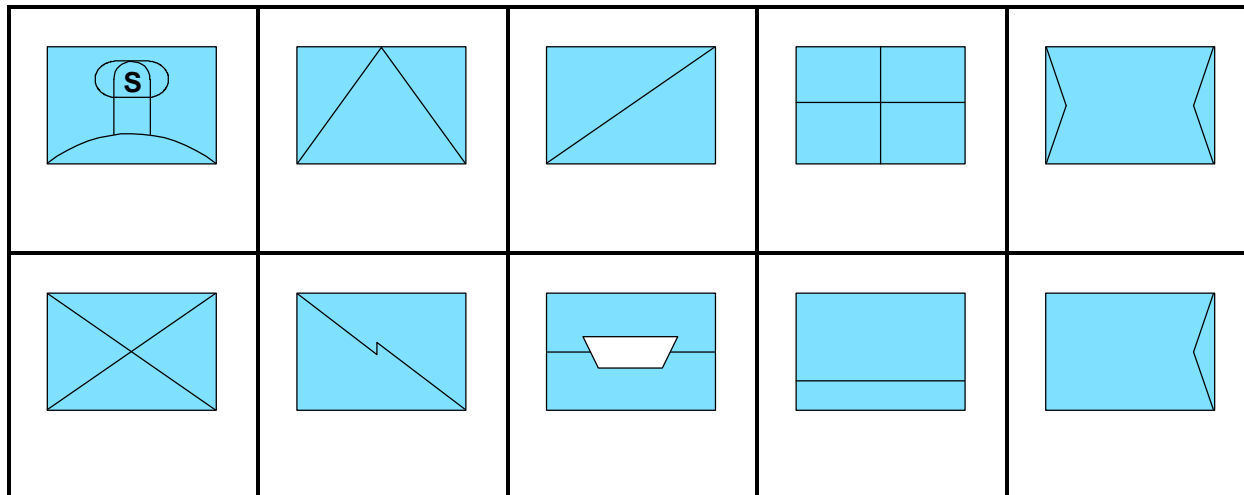
APPENDIX C

FIGURE C-1. Symbol frame relative sizes (cont'd).

Air and Space	Surface Frames (units, equipment and installations)		Subsurface frames
	 Units and installations	 Equipment	
			
			
	Regular octagon forms the basis of frame sizing.		

b. In general, icons should not be so large as to touch the interior border of the frame. Figure C-2 illustrates example exceptions to this size rule. The icons in this figure occupy the entire frame and must, therefore, touch the interior border of the frame. The dimensions of unframed icons should be the same as framed icons.

APPENDIX C

FIGURE C-2. Example exceptions to icon placement.

c. The height of text information in a symbol modifier will be .3L. The length of the lines in a direction of movement indicator should be the same as the height of the symbol frame. The headquarters staff indicator should extend a distance of one frame height below the bottom of the frame. When a symbol is reduced to a size smaller than three lines text, the text will be positioned so that the symbol is centered relative to its associated field identifier text to maintain the relationship between the symbol and text.

C.4.2 Symbol size. Symbol size is directly related to the viewing distance of the warfighter from the display surface on which the symbol is presented. MIL-STD-1472D recommends a minimum size of 20 minutes of arc subtended visual angle (arc min.) for distinguishing targets of complex shape on a cathode ray tube, without regard to the effect of color coding. The following formula can be used to determine symbol size for a given implementation:

$$L = \frac{(VA)(D)}{(57.3)(60)}$$

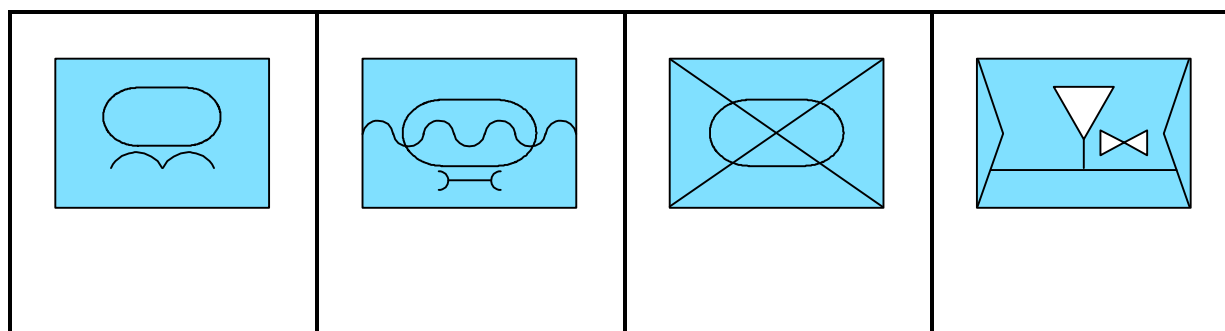
where VA is the visual angle in arc minutes, D is the viewing distance in inches, and L is the symbol size in inches. Table C-I presents symbol dimensions at 20, 30, and 40 arc minutes for selected viewing distances. In general, medium to large symbol sizes (i.e., subtending 30-40 arc minutes) are recommended; however, implementors should conduct usability testing to determine the optimum symbol size(s) at which warfighter performance is most effective.

APPENDIX C

TABLE C-I. Minimum symbol size at selected viewing distances.

Symbol Size			
Viewing Distance (in inches)	20 arc min.	30 arc min.	40 arc min.
15	.087 in. (2.21 mm)	.131 in. (3.33 mm)	.175 in. (4.45 mm)
20	.116 in. (2.95 mm)	.175 in. (4.45 mm)	.233 in. (5.92 mm)
25	.145 in. (3.68 mm)	.218 in. (5.54 mm)	.291 in. (7.40 mm)
30	.175 in. (4.45 mm)	.262 in. (6.65 mm)	.349 in. (8.87 mm)
35	.204 in. (5.18 mm)	.305 in. (7.76 mm)	.407 in. (10.34 mm)
40	.233 in. (5.92 mm)	.349 in. (8.87 mm)	.465 in. (11.82 mm)

C.4.3 Placement of multiple icons. Symbols that define many Army units are complex and include original size icons overlaid onto each other. Some complex symbols require the icon to be shifted or reduced in size so that it will be visible (see figure C-3).

FIGURE C-3. Complex symbol with multiple icons.

C.4.4 Adding temporary features to standard symbols. The information taxonomy and symbol hierarchy included in this standard provide a logical structure from which to define a set of design rules for the construction of symbols. A single graphic feature or attribute was selected to represent each type of information known about a warfighting object, with the same feature included in the symbol whenever that type of information is represented. In appendix D, the description of an object in terms of its position within the information hierarchy directly maps to the graphic features included in the icon. For example, whenever a helicopter object is rendered, one feature of its icon is a "bow tie" graphic. Each icon in appendix D was constructed from the combination of graphics consistent with its position within the hierarchy. The approach taken in this standard differs from the concept of icons as composites of graphic "primitives" in that the placement of a given feature may vary as needed to maximize legibility when the icon is displayed within a frame. When implementations require temporary extensions to the symbology provided in this standard,

APPENDIX C

the following display rules apply:

- (1) Implementations shall not modify the frame shapes defined in this standard to indicate affiliation, battle dimension, and status.
- (2) Implementations shall use the default frame colors defined in this standard to indicate affiliation. If differentiation is needed within an affiliation category, additional colors should be used (i.e., for the frame or color fill) within that category, but the default colors for the other affiliations should not be changed. Hardware permitting and unless specifically prohibited by system specification for operational reasons, implementation of this standard should provide for operator control of color to the individual icon level. The intent is maximum operational flexibility in those situations where the basic default colors are not sufficient for ready discrimination (i.e. multiple hostiles which must be differentiated from each other) and to assign a specific color to a special interest target without reference to its affiliation.
- (3) Implementations needing to display additional role or mission information about a warfighting object should use the icons in appendix D as the basis from which to create any temporary symbols. Figure C-4 presents some of the graphic extensions that can be added to these icons. Whenever possible, the basic representation of the icon should not be altered; a graphic extension should be an addition to the basic icon and positioned to ensure that overall symbol legibility is not degraded. Figure C-4 provides an example of how the basic icon is combined with an extension to produce a temporary symbol.

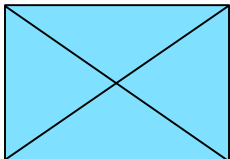

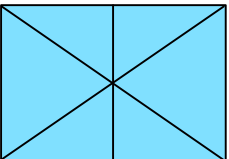
Basic symbol	Icon extender	Extended symbol
		
Infantry	Motorized modifier	Motorized infantry

FIGURE C-4. Extending the symbol.

C.4.5 Line width. Because the symbol frame indicates both the affiliation and battle dimension of an object, it is critical that line width be sufficient to ensure frame legibility and discriminability at normal viewing distance. The optimum line width may differ depending on frame size and be affected by whether the frame is filled or unfilled or displayed in color or black/white. Usability testing should be performed to identify the optimum rendering for a given implementation.

APPENDIX C

C.4.6 Color. It is important that implementations maximize the contrast between symbols and the display background in order to provide optimum discriminability. In general, this contrast can be provided by using black for the frame, icon, and modifiers when symbols are displayed on a light background, and using white for these elements when symbols are displayed on a dark background. Implementations choosing to display a color fill shall also display the appropriate icon from table D-1 within the symbols. Implementors should select specific values (e.g., in CIE or RGB terms) for the default colors in table C-II based on considerations such as operational requirements, hardware configuration, display background, and viewing conditions (e.g., ambient lighting). If a symbol includes a frame and an icon, both components, as well as others, should be the same color (e.g., black, white, or one of the default colors indicating affiliation). Implementors should comply with color guidance provided in the *DOD Human Computer Interface (HCI) Style Guide* and include sufficient usability testing to ensure effective operator performance when using the symbology. While color coding shall be the same throughout an implementation, color saturation may need to vary depending on the display option(s) selected. For example, to ensure optimum symbol discriminability, different shades of red may be needed in a frame-only symbol as compared to the color fill in a symbol with a black frame and icon.

TABLE C-II. Default colors.

Description	Hand-Drawn	Computer Generated	
		ICON (RGB Value)	FILL (RGB Value)
Friend, Assumed Friend	Blue	Cyan (0, 255, 255)	Crystal Blue (128, 224, 255)
Unknown, Pending	Yellow	Yellow (255, 255, 0)	Light Yellow (255, 255, 128)
Neutral	Green	Neon Green (0, 255, 0)	Bamboo Green (170, 255, 170)
Hostile, Suspect, Joker, Faker	Red	Red (255, 0, 0)	Salmon (255, 128, 128)
Weather	Purple	Plumb Red (128, 0, 128)	Light Orchid (226, 159, 255)
Weather	Brown	Safari (128, 98, 16)	Khaki (210, 176, 106)
Boundaries, lines, areas, text, icons, and frames	Black	Black (0, 0, 0)	Black (0, 0, 0)

APPENDIX C

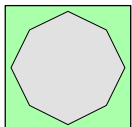
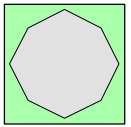
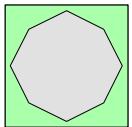
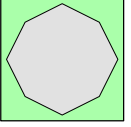
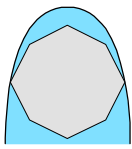
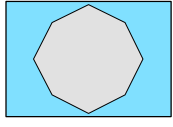
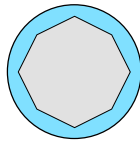
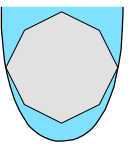
TABLE C-II. Default colors (cont'd).

Description	Hand-Drawn	Computer Generated	
		ICON (RGB Value)	FILL (RGB Value)
(See note)	White	White (255, 255, 255)	Off-White (6% Grey) (239, 239, 239)

Note: Off-white (vice black) may be used as the default color depending on the background for boundaries, lines, areas, text, icons, and frames.

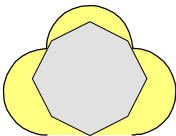
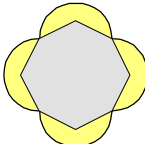
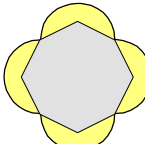
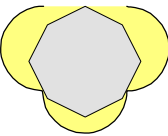
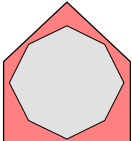
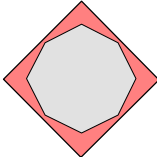
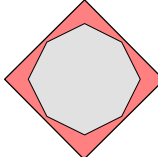
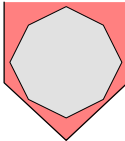
C.4.7 Icon placement within frames. The geometric center of the icon should be placed at the geometric center of the frame, as shown in table C-III, except in the hostile, friend, assumed friend, faker, joker, and suspect open frames. In these frames, the geometric center of the icon should be placed one-third of the way down the vertical axis starting from the open end, as shown in table C-III.

TABLE C-III. Icon placement.

Dimension Affiliation	Air/space	Land	Sea Surface and Land equipment	Subsurface
Neutral				
Friend				







APPENDIX C

TABLE C-III. Icon placement(cont'd).

Dimension Affiliation	Air/space	Land	Sea Surface and Land equipment	Subsurface
Unknown				
Hostile				

























C.4.8 Equipment mobility indicators. Table C-IV shows mobility indicators that shall be used only with equipment. These indicators are identified in positions 11-12, (size/mobility) of the symbol code described in appendix B.

TABLE C-IV. Equipment mobility indicators.

DESCRIPTION					
MOBILITY SYMBOL	UN-FRAMED	UN-KNOWN	FRIEND	NEUTRAL	HOSTILE
Wheeled (limited cross-country)					
					

























APPENDIX C

TABLE C-IV. Equipment mobility indicators (cont'd).

DESCRIPTION					
MOBILITY SYMBOL	UN-FRAMED	UN-KNOWN	FRIEND	NEUTRAL	HOSTILE
Wheeled (cross-country)					
					
Tracked					
					
Wheeled and Tracked					
					
Towed					
					

APPENDIX C

TABLE C-IV. Equipment mobility indicators (cont'd).

DESCRIPTION					
MOBILITY SYMBOL	UN-FRAMED	UN-KNOWN	FRIEND	NEUTRAL	HOSTILE
Railway					
					
Over-snow (prime mover)					
					
Sled					
					
Pack Animals					
					

APPENDIX C

DESCRIPTION					
MOBILITY SYMBOL	UN- FRAMED	UN-KNOWN	FRIEND	NEUTRAL	HOSTILE
Barge					
Amphibious					

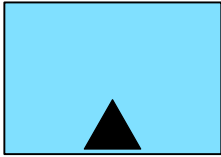
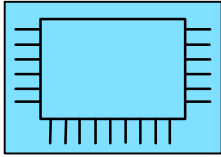
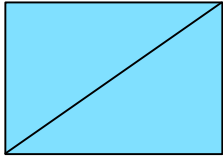
C.4.9 Adding new modifiers. A number of symbol modifiers are incorporated into this standard (see table C-V), but additional modifiers may be required. Organizations requiring additional symbol modifiers shall submit change proposals to the Configuration Management Board for formal processing. Symbol modifiers being processed as change proposals may be incorporated for use into the originator's systems but will not be approved for use until formal Configuration Control Board processing is complete.

TABLE C-V. Sub-role identifiers.

DESCRIPTION/SYMBOL			
Air Assault	Air assault w/organic lift	Air assault w/organic lift (NATO only)	Airborne

APPENDIX C

TABLE C-V. Sub-role identifiers (cont'd).

DESCRIPTION/SYMBOL			
			
Mountain	Outpost (combat)	Reconnaissance	